



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/765,014	01/17/2001	Oscar E. Agazzi	36976/NJP/B600	7258
7590 10/18/2005 CHRISTOPHER C. WINSLADE MCANDREWS, HELD & MALLOY 500 W. MADISON STREET SUITE 3400 CHICAGO, IL 60661			EXAMINER KIM, DAVID S	
			ART UNIT 2633	PAPER NUMBER

DATE MAILED: 10/18/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/765,014

Applicant(s)

AGAZZI, OSCAR E.

Examiner

David S. Kim

Art Unit

2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 01 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) See Continuation Sheet is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 April 2005 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

Continuation of Disposition of Claims: Claims pending in the application are 1,4-9,11,12,15,16,18-20,22-24,26-28,30-32,35-38,40-42,44-46,48-50,52-55,57,59-61,63-65,68-71,73-75 and 77-80.

Continuation of Disposition of Claims: Claims rejected are 1,4-9,11,12,15,16,18-20,22-24,26-28,30-32,35-38,40-42,44-46,48-50,52-55,57,59-61,63-65,68-71,73-75 and 77-80.

## DETAILED ACTION

### Oath/Declaration

1. Applicant's response to Examiner's notice of the defective declaration in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by sending a new declaration (filed on 01 April 2005) that corrects for the previous defective declaration. That is, the previous defective declaration incorrectly indicated that the filing date of this instant application is 17 January 2000. The new declaration correctly indicates that the filing date of this instant application is 17 January 2001.

### Drawings

2. Applicant's compliance with the objections to the drawings (for minor informalities) in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by sending replacement drawings and some portions of the specification. The replacement drawings were received on 01 April 2005. These drawings are **disapproved**. The drawings are still objected to because of a large number of minor informalities. Some of these informalities are listed below:

**Fig. 5** is disapproved because reference character "111" is used where -- 215 -- may be intended.

**Fig. 6** is disapproved because reference character "631," which is mentioned on p. 13, l. 11 in apparent reference to Fig. 6, is not in Fig. 6.

Careful review of the drawings is encouraged to correct these and the remaining unlisted informalities.

3. Applicant's compliance with the objections to the drawings (for claim limitations not shown in the drawings) in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by canceling claims 3, 10, 14, 17, 21, 25, 34, 47, and 67 and amending claims 6, 12, and 79. Applicant's response overcomes all of these objections. Thus, the previous objections are withdrawn.

### Claim Objections

4. Applicant's compliance with the objections to **claims 1, 11, 16, 20-21, 28, and 56-57** in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by

Art Unit: 2633

amending claims 1, 11, 16, 20, 28, and 57 and canceling claims 21 and 56. Applicant's response overcomes the previous objections. Thus, the previous objections are withdrawn.

5. **Claims 1 and 49** are objected to because of the following informalities:

In claim 1, last line, "an optical channel" is used where -- the optical channel -- may be intended.

In claim 49, line 1, "A method as in claim wherein" is used where -- A method as in claim 1 wherein -- may be intended.

Appropriate correction is required.

**Claim Rejections - 35 USC § 112**

6. Applicant's compliance with the rejection of **claims 3, 10, 14, 21, 34, and 67** under 35 U.S.C. 112, first paragraph (enablement requirement) in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by canceling these claims, rendering the rejection moot. Accordingly, the previous rejection is withdrawn.

7. Applicant's compliance with the rejection of **claims 6, 12, and 17** under 35 U.S.C. 112, first paragraph (enablement requirement) in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by amending claims 6 and 12 and canceling claim 17. Applicant's response overcomes the previous rejection. Accordingly, the previous rejection is withdrawn.

Applicant's compliance with the rejection of **claims 25, 47, and 79** under 35 U.S.C. 112, first paragraph (scope of enablement) in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by canceling claims 25 and 47 and addressed claim 79 by amending claim 75, which is the independent claim for dependent claim 79. Applicant's response overcomes the previous rejection. Accordingly, the previous rejection is withdrawn.

8. Applicant's compliance with the rejection of **claims 32 and 37** under 35 U.S.C. 112, second paragraph in the previous Office Action (mailed on 29 September 2004) is noted and appreciated. Applicant responded by amending claims 32 and 37. Applicant's response overcomes the previous rejection. Accordingly, the previous rejection is withdrawn.

Art Unit: 2633

***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. **Claims 1, 4, 6-9, 11-12, 15, 18-20, 22-24, 26-28, 30, 32, 35, 37-38, 40, 42, 44, 46, 48-50, 52-55, 57, 59, 61, 63, 65, 68, 70-71, 73, 75, and 77-80** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ling et al. (International Application No. WO 98/39871, hereinafter "Ling") in view of any/all of Ungerboeck ("Channel coding with multilevel/phase signals"), Lee (*Convolutional Coding: Fundamentals and Applications*), and Schlegl (*Trellis Coding*) and further in view of Uyematsu et al. ("Trellis coded modulation for multilevel photon communication systems," hereinafter "Uyematsu").

**Regarding claim 1**, Ling discloses:

A method for high-speed transmission of information data on a channel, the method comprising:  
encoding (Fig. 3, portion before DAC 326) information via a trellis encoder to produce digital multilevel symbols;

equalizing the digital multilevel symbols to compensate for characteristics of the channel (p. 3, l. 17-28)

converting (DAC 326) the digital multilevel symbols into analog multilevel symbols; and  
transmitting the analog multilevel signals (output of DAC 326) over the channel.

Ling does not expressly disclose:

said channel being an optical channel.

However, the method of Ling appears to be a trellis coded modulation (TCM) scheme (implied by trellis decoder 366 in Fig. 3 of Ling), and Uyematsu teaches that applying TCM to optical communication systems is known in the art (Uyematsu, p. 582, col. 1, last paragraph). The only portion of a TCM system that appears lacking in the system of Ling is an express disclosure of a trellis encoder. However, it is

Art Unit: 2633

known that trellis encoding incorporates convolutional encoding and mapping, as shown in Ungerboeck (p. 58, Fig. 3), Lee (p. 159, Figure 7.11), and Schlegl (p. 44, Fig. 3.1 shows a trellis encoder; p. 91 and Fig. 4.1 show that the FSM in Fig. 3.1 is a convolutional encoder). Fig. 3 of Ling shows basic elements of a trellis encoder: a convolutional encoder 320 and bit to symbol mapping 322. At the time the invention was made, it would have been obvious to one of ordinary skill in the art to employ Ling's convolutional encoder 320 and bit to symbol mapping 322 as a trellis encoder. One of ordinary skill in the art would have been motivated to do this since the trellis decoder 366 of Ling implies the complementary use of trellis encoding. As an additional motivation, trellis encoding provides an advantage over just convolutional encoding: preservation of bandwidth (Schlegl, p. 8).

Accordingly, the system of Ling in view of any/all of Ungerboeck, Lee, and Schlegl would constitute a TCM system. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to apply the TCM method of Ling in view of any/all of Ungerboeck, Lee, and Schlegl to an optical communication system to transmit the analog multilevel signals over an *optical* channel. One of ordinary skill in the art would have been motivated to do this since TCM is attractive in optical communication systems. That is, TCM can help relieve bandwidth limits imposed on an optical system by the optical system's electrical parts (Uyematsu, p. 582, col. 1, last paragraph). Also, it is well known that optical channels, such as optical fiber, offer benefits over other types of channels, such as electrical channels. Some well-known benefits of optical fiber are low loss and lower susceptibility to electromagnetic interference.

**Regarding claim 4,** Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

The method of claim 1 wherein equalizing the digital multilevel symbols comprises precoding the digital multilevel symbols using a Tomlinson Harashima precoder (Tomlinson/Harashima precoding 324).

**Regarding claim 6,** Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

Art Unit: 2633

The method of claim 1 wherein the information that is encoded comprises input bits and wherein encoding the information includes mapping the input bits into digital multilevel symbols (bits to symbol mapping 322).

**Regarding claim 7,** Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

The method of claim 1 wherein transmitting the analog multilevel symbols over an optical channel comprises modulating the intensity of a light source according to the level of the analog multilevel symbols (Uyematsu, “intensity modulator,” p. 582, middle of col. 2).

**Regarding claim 8,** Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

The method of claim 1 wherein transmitting the analog multilevel signals over an optical channel comprises modulating laser intensity according to a level of the analog multilevel signals (Uyematsu, “intensity modulator,” p. 582, middle of col. 2).

**Regarding claim 9,** Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

A method as in claim 1 wherein equalizing the digital multilevel symbols to compensate for the laser and channel characteristics comprises:

characterizing the channel (i.e. channel responses on p. 2, l. 31-35); and

applying an inverse characterization of the channel to the digital multilevel symbols (i.e. filter coefficients on p. 3, l. 17-22).

**Regarding claim 11,** claim 11 is a method claim that corresponds largely to the method claim 1. Therefore, the recited steps in method claim 1 read on the corresponding steps in method claim 11. Claim 11 also includes limitations absent from claim 1. Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu does not expressly disclose these limitations:

accepting information from a plurality of sources;

a *plurality of* trellis encoders, digital multilevel symbols, analog multilevel signals; and



Art Unit: 2633

transmitting the analog multilevel signal by time division multiplexing the plurality of analog multilevel signals onto an optical channel.

However, Examiner takes Official Notice that these “plurality” limitations are all part of an extremely well known practice of transmitting a time division multiplexed signal. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement these limitations in the method of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu. One of ordinary skill in the art would have been motivated to do this since transmitting a time division multiplexed signal is a common way to transmit multiple channels of data across a single optical communication line (fiber), thus increasing the number of users without requiring the installation of additional optical communication lines (fibers).

**Regarding claims 12, 15, and 18-20**, claims 12, 15, 18, 19, and 20 are method claims that correspond to method claims 6, 4, 7, 8, and 9, respectively. Therefore, the recited steps in method claims 4 and 6-9 read on the corresponding steps in method claims 12, 15, and 18-20.

**Regarding claims 22-23**, Examiner takes Official Notice that each of these claims discloses known ways to implement the extremely well known practice of transmitting a time division multiplexed signal. Claim 22 discloses a way using a *single* analog to digital converter. Claim 23 discloses a way using a *plurality* of digital to analog converters. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement these various ways in the method of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu. One of ordinary skill in the art would have been motivated to do this since each offers design flexibility for the system of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu.

**Regarding claim 24**, Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

A method of receiving data from an optical channel, the method comprising:  
accepting a multilevel optical signal from the channel into an optical to electrical converter (Uyematsu, “photo counting receiver,” p. 582, middle of col. 2);  
converting the multilevel signal into an analog electrical signal;

Art Unit: 2633

converting the analog electrical signal into a digital signal (Ling, ADC 360 in Fig. 3);

equalizing the digital signal (Ling, FFE 362 or DFE 380); and

decoding the digital signal in a trellis decoder (Ling, trellis decoder 366).

**Regarding claim 26**, Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

The method of claim 24 wherein equalizing the digital signal comprises applying a decision feedback equalization (DFE 380) to the digital signal.

**Regarding claim 27**, Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu does not expressly disclose:

A method as in claim 24 wherein converting the analog electrical signal to a digital signal comprises:

*successively sampling* the analog electrical signal; and

converting the *successive samplings* into a plurality of *parallel* digital values.

However, Examiner takes Official Notice that these limitations are all part of an extremely well known practice of receiving a time division multiplexed signal, in particular the successive sampling and parallel teachings. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement these limitations in the method of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu. One of ordinary skill in the art would have been motivated to do this since receiving a time division multiplexed signal is a common way to receive multiple channels of data across a single optical communication line (fiber), thus increasing the number of users without requiring the installation of additional optical communication lines (fibers).

**Regarding claim 28**, Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

A method of signaling over an optical channel, the method comprising:

accepting data from a source (reception of data in 310 in Fig. 3);

trellis encoding the data (Fig. 3, portion before DAC 326);

equalizing the data (Ling, Fig. 3, Tomlinson/Harashima precoding 324);

Art Unit: 2633

coupling the equalized encoded data into an optical channel (Uyematsu, “intensity modulator,” p. 582, middle of col. 2);

conveying the data over the optical channel;

accepting data from the optical channel (Uyematsu, “intensity modulator,” p. 582, middle of col. 2);

decoding the data accepted from the optical channel (receiver 312); and

providing the decoded data to an interface (output of receiver 312).

**Regarding claim 30**, Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses:

A method as in claim 28 wherein equalizing the data comprises applying a Tomlinson-Harashima precoding to the data (Fig. 3, Tomlinson/Harashima precoding 324).

**Regarding claims 32, 35, and 37**, claims 32, 35, and 37 are apparatus claims that correspond to method claims 1, 4, and 8, respectively. Therefore, the recited steps in method claims 1, 4, and 8 read on the corresponding means in apparatus claims 32, 35, and 37. Claims 32, 35, and 37 also include limitations absent from claims 1, 4, and 8. Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses these limitations:

an analog signal to optical converter that converts the analog signal to an optical level for coupling into an optical channel (Uyematsu, “intensity modulator,” p. 582, middle of col. 2).

**Regarding claims 38 and 40**, claims 38 and 40 are apparatus claims that correspond to method claims 11 and 15, respectively. Therefore, the recited steps in method claims 11 and 15 read on the corresponding means in apparatus claims 38 and 40. Claims 38 and 40 also include limitations absent from claims 11 and 15. Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses some of these limitations:

an optical source that receives the plurality of analog multilevel signals and produces a light output (Uyematsu, “intensity modulator” and corresponding light source for the modulator, p. 582, middle of col. 2) for driving an optical channel.

Art Unit: 2633

Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu does not expressly disclose:

a plurality of data signals;

a plurality of equalizers; and

a plurality of equalized digital multilevel signals.

However, Examiner takes Official Notice that these “plurality” limitations are all part of an extremely well known practice of transmitting a time division multiplexed signal. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to implement these limitations in the method of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu. One of ordinary skill in the art would have been motivated to do this since transmitting a time division multiplexed signal is a common way to transmit multiple channels of data across a single optical communication line (fiber), thus increasing the number of users without requiring the installation of additional optical communication lines (fibers).

**Regarding claims 42 and 44,** claims 42 and 44 are apparatus claims that correspond largely to the method claims 11 and 15, respectively. Therefore, the recited steps in method claims 11 and 15 read on the corresponding means in apparatus claims 42 and 44. Claims 42 and 44 also include limitations absent from claims 11 and 15. These limitations are:

a plurality of equalizers; and

a digital to analog converter that *sequentially* accepts the plurality of equalized digital multilevel signals and produces a plurality of *sequential* analog multilevel signals.

However, Examiner notes that the treatment of claim 11 incorporates a time division multiplexed signal. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to include these “plurality” and “sequential” limitations in the apparatus of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu. One of ordinary skill in the art would have been motivated to do this since time division multiplexing requires *sequential* treatment of a *plurality* of channels.

Art Unit: 2633

**Regarding claims 46 and 48**, claims 46 and 48 are apparatus claims that correspond to method claims 24 and 26, respectively. Therefore, the recited steps in method claims 24 and 26 read on the corresponding means in apparatus claims 46 and 48.

**Regarding claim 49**, claim 49 is a method claim that corresponds to method claim 23. Therefore, the recited steps in method claim 23 read on the corresponding steps in method claim 49.

**Regarding claims 50 and 52-53**, claims 50, 52, and 53 are method claims that correspond to method claims 24, 26, and 24, respectively. Therefore, the recited steps in method claims 24 and 26 read on the corresponding steps in method claims 50 and 52-53.

**Regarding claim 54**, claim 54 is a method claim that corresponds largely to method claim 27. Therefore, the recited steps in method claim 27 read on the corresponding steps in method claim 54. Claim 54 also includes limitations absent from claim 27. These limitations are:

*plurally* sampling the analog electrical signal into *a plurality of A/D converters*.

However, Examiner notes that the treatment of claim 27 incorporates a time division multiplexed signal. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to include these “plurality” limitations in the apparatus of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu. One of ordinary skill in the art would have been motivated to do this since time division multiplexing requires treatment of *a plurality of channels*.

**Regarding claim 55**, claim 55 is a method claim that corresponds to method claim 54. Therefore, the recited steps in method claim 54 read on the corresponding steps in method claim 54.

**Regarding claims 57 and 59**, claims 57 and 59 are method claims that correspond to method claims 28 and 30, respectively. Therefore, the recited steps in method claims 28 and 30 read on the corresponding steps in method claims 57 and 59.

**Regarding claims 61 and 63**, claims 61 and 63 are method claims that correspond largely to method claims 28 and 30, respectively. Therefore, the recited steps in method claims 28 and 30 read on the corresponding means in apparatus claims 61 and 63. Claims 61 and 63 also include limitations absent from claims 28 and 30. Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu discloses these limitations:

Art Unit: 2633

converting the data accepted from the optical channel to digital data (ADC 360 in Fig. 3); and decoding the digital data accepted from the optical channel (portion after ADC 360).

**Regarding claims 65, 68, and 70**, claims 65, 68, and 70 are method claims that correspond to method claims 32, 35, and 37, respectively. Therefore, the recited steps in method claims 32, 35, and 37 read on the corresponding steps in method claims 65, 68, and 70.

**Regarding claims 71 and 73**, claims 71 and 73 are method claims that correspond to apparatus claims 38 and 40, respectively. Therefore, the recited means in apparatus claims 38 and 40 read on the corresponding means in apparatus claims 71 and 73.

**Regarding claims 75 and 77-79**, claims 75, 77, 78, and 79 are apparatus claims that correspond to apparatus claims 46, 48, 46, and 48, respectively. Therefore, the recited means in apparatus claims 46 and 48 read on the corresponding means in apparatus claims 75 and 77-79.

**Regarding claim 80**, claim 80 is method claim that corresponds to method claim 24. Therefore, the recited steps in method claim 24 read on the corresponding steps in method claim 80.

11. **Claims 5, 16, 31, 36, 41, 45, 60, 64, 69, and 74** are rejected under 35 U.S.C. 103(a) as being unpatentable over Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu as applied to claims 2, 13, 30, 32, 39, 43, 59, 63, 66, and 72 above, and further in view of Fischer et al. ("Dynamics limited precoding, shaping, and blind equalization for fast digital transmission over twisted pair lines," hereinafter "Fischer").

**Regarding claim 5**, Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu does not expressly disclose:

The method of claim 1 wherein the equalizing the digital multilevel symbols comprises precoding the digital multilevel symbols using a dynamic limiting precoder.

However, dynamics limiting precoders are known in the art. Fischer teaches such precoders (Fischer, Fig. 4). At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to improve the Tomlinson Harashima precoder of Ling in view of any/all of Ungerboeck, Lee, and Schlegl and further in view of Uyematsu by implementing the dynamics limiting precoder teachings of Fischer. One of ordinary skill in the art would have been motivated to do this since dynamics

Art Unit: 2633

limiting precoding is a straightforward extension of Tomlinson Harashima precoding that provides the advantage of a lower dynamic range of the receiver input signal (Fischer, p. 1626, col. 1, last paragraph). When the dynamic range becomes very large, implementation of the system becomes complicated (Fischer, p. 1624, middle of col. 2).

**Regarding claim 16**, claim 16 is a method claim that corresponds to method claim 5. Therefore, the recited steps in method claim 5 read on the corresponding steps in method claim 16.

**Regarding claim 31**, claim 31 introduces a limitation that is addressed by Fischer (see treatment of claim 5 above). Similarly, Fischer is applied here to address the same limitation.

**Regarding claim 36**, claim 36 is an apparatus claim that corresponds to method claim 5. Therefore, the recited steps in method claim 5 read on the corresponding means in apparatus claim 36.

**Regarding claims 41 and 45**, claims 41 and 45 are apparatus claims that both correspond to method claim 16. Therefore, the recited steps in method claim 16 read on the corresponding means in apparatus claims 41 and 45.

**Regarding claim 60**, claim 60 is a method claim that corresponds to method claim 31. Therefore, the recited steps in method claim 31 read on the corresponding steps in method claim 60.

**Regarding claim 64**, claim 64 is a method claim that corresponds to method claim 31. Therefore, the recited steps in method claim 31 read on the corresponding steps in method claim 64.

**Regarding claim 69**, claim 69 is an apparatus claim that corresponds to method claim 36. Therefore, the recited steps in method claim 36 read on the corresponding means in apparatus claim 69.

**Regarding claim 74**, claim 74 is a method claim that corresponds to the apparatus claim 41. Therefore, the recited means in apparatus claim 41 read on the corresponding steps in method claim 74.

#### **Response to Arguments**

12. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. Notice the newly applied references from Ungerboeck, Lee, and Schlegl.

Art Unit: 2633

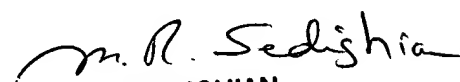
***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Kim whose telephone number is 571-272-3033. The examiner can normally be reached on Mon.-Fri. 9 AM to 5 PM (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DSK

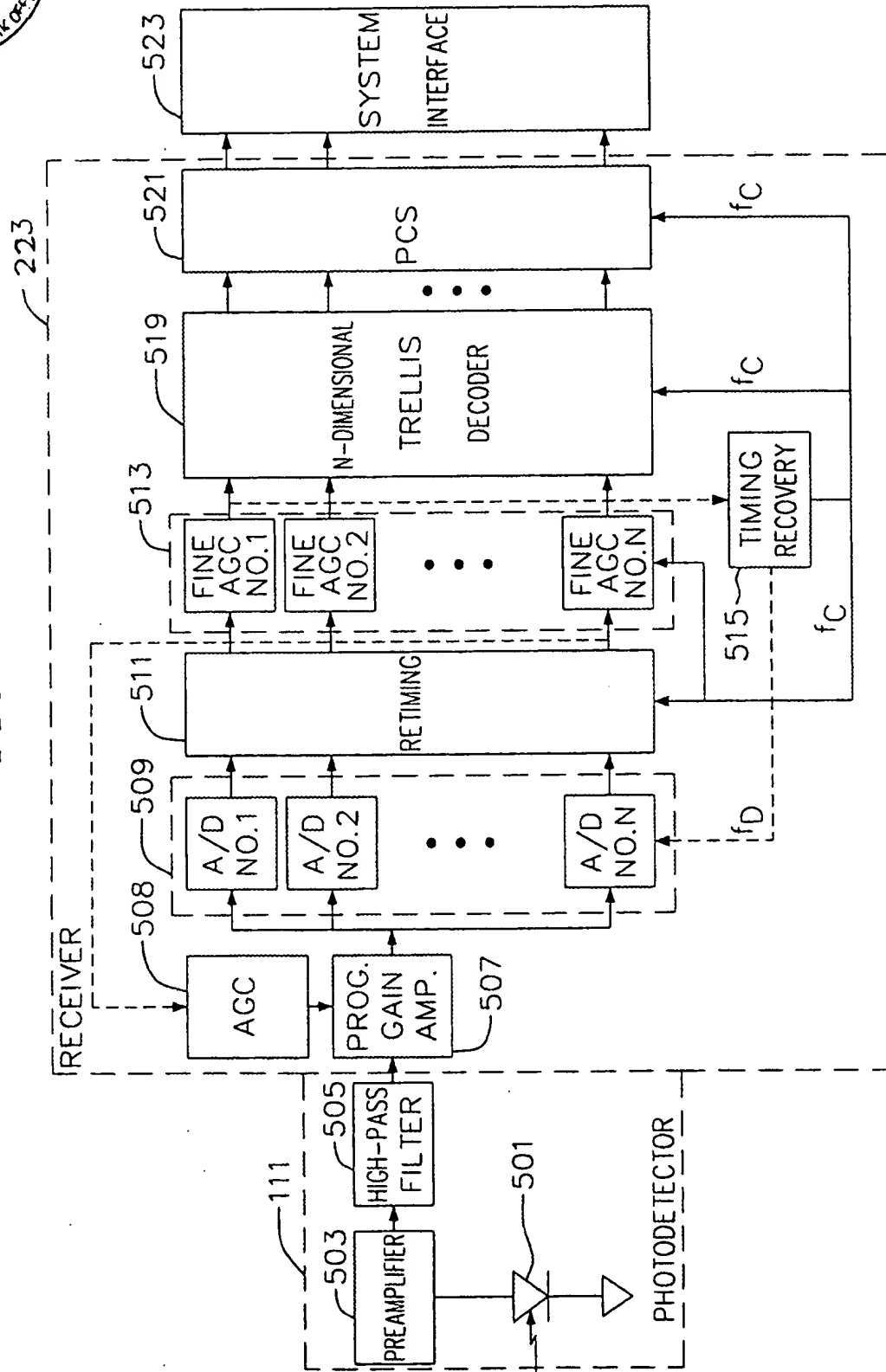
  
**M. R. SEDIGHIAN**  
**PRIMARY EXAMINER**





Disapproved by DSK  
 05 OCTOBER 2008

FIG. 5





TITLE: High Speed Transmission System for Optical Channels  
INVENTOR: Agazzi  
APPLICATION NO.: 09/765,014,  
CONF. NO. 7258; DOCKET NO. 13445US02  
ATTORNEY: JAW, PHONE: 312-775-8000  
Replacement Figure 6

Disapproval by DSL  
05 OCTOBER 2005

FIG. 6

